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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,231	03/31/2004	Michael S. Faunce	ROC920040006US1	8119

46296 7590 03/30/2007

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EXAMINER	
AHN, SANGWOO	
ART UNIT	**PAPER NUMBER**
2166	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/815,231	FAUNCE ET AL.	
	Examiner	Art Unit	
	Sangwoo Ahn	2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5-8,14,15,22,25,26 and 29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-8,14,15,22,25,26 and 29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's communication filed on 1/12/2007 has been entered.

Claims 5 – 8, 14 – 15, 22, 25 – 26 and 29 are pending in this Office Action.

Claims 5, 7, 14, 22 and 26 have been amended.

Claims 1 – 4, 9 – 13, 16 – 21, 23 – 24 and 27 – 28 have been canceled.

Response to Arguments

Applicant's arguments filed on 1/12/2007 have been fully considered but they are not persuasive.

Applicant mainly argued:

• Regarding claim 5, nowhere does Lee teach or suggest reading statistical information regarding additional keys in a sub-optimal index.

• Regarding claim 5, Balmin does not teach rewriting a query using statistical information regarding an additional key.

• Regarding claim 5, the table statistics in Jakobsson do not read on an estimated number of rows in the database table that satisfy the query as recited in claim 5.

• Regarding claims 6, 8, 15, 25 and 29, nowhere does Lohman teach or suggest a frequent value list that corresponds to an additional key in a sub-optimal index.

Examiner respectfully traverses the Applicant's arguments for the following reasons:

• Lee does teach or suggest reading statistical information regarding the additional key in column 2 lines 42 – 48; 53 – 63. The claim limitation "statistical information" is given the broadest reasonable interpretation. Lee states, "the search will request a range of entries that include every possible value of the missing key column or combination of the missing key column with key columns of lower order than the missing key."

• Balmin does teach rewriting a query using statistical information in paragraph 17. The aspects concerning "sub-optimal index" and "additional key" are disclosed in Lee as described above. Balmin discloses a system that rewrites queries according to the computed information ("computes compensation and rewrites the query accordingly.").

• The table statistics in Jakobsson does read on an estimated number of rows in the database table that satisfy the query from the evidences provided in paragraph 10. Jakobsson clearly states that table statistics are used to estimate important optimizer cost parameters such as the fraction or percentage or rows in a table that match some condition (equivalent to the estimated number of rows in the database table that satisfy the query) and table cardinalities (the number of rows in a table).

• In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The aspects of "sub-optimal index" and "additional key" are disclosed in Lee as

described above. Lohman discloses that the statistical information comprises a frequent values list in paragraph 35 lines 10 – 15 ("a list of the most frequent values").

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5, 7, 14, 22 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of U.S. Publication Number 2005/0097084 issued to Andrey L. Balmin et al, further in view of U.S. Publication Number 2004/0225639 issued to Hakan Jakobsson et al (hereinafter "Balmin" and "Jakobsson").

Regarding claim 5, Lee discloses,

An apparatus comprising:

at least one processor (Figure 1 element 2, et seq.);

a memory coupled to the at least one processor (Figure 1 element 2, et seq.);

a database table residing in the memory (column 1 lines 39 – 40, et seq.);

a query residing in the memory that accesses the database table (Figure 1 element 20, et seq.); and

a query optimizer residing in the memory and executed by the at least one processor (Figure 1 element 20, et seq.), wherein the query optimizer analyzes the query, and if no optimal index for the query exists, the query optimizer determines if a sub-optimal index exists, a sub-optimal index including at least one key referenced in

the query and additionally including at least one additional key that prevents traversal of the sub-optimal index to determine the number of rows that the query will return (column 2 lines 42 – 44, column 6 lines 56 – 60, et seq.), wherein if a sub-optimal index exists, the query optimizer, for each additional key in the sub-optimal index, reads statistical information regarding the additional key (column 6 lines 14 – 19; 42 – 47, et seq.).

Lee does not explicitly disclose,

• rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query.

• determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query.

However, Balmin and Jakobsson respectively disclose the above features.

First, Balmin discloses rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query (paragraph 17, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Balmin's method of rewriting the query would have enabled Lee's overall system to speed up the processing of potentially expensive queries by using pre-computed information (paragraph 16 lines 1 – 3, et seq.).

Second, Jakobsson discloses determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the

query (paragraph 10, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Jakobsson's method of determining an estimated number of rows that satisfy the query would have enabled Lee's overall system to estimate the cost of alternative execution plans (paragraph 10 line 3, et seq.) and reduce CPU usage and physical disk reads (paragraph 33 lines 1 – 2, et seq.).

Regarding claim 7, Lee discloses,

An apparatus comprising:

at least one processor;

a memory coupled to the at least one processor;

a database table residing in the memory;

a query residing in the memory that accesses the database table;

an index residing in the memory that includes at least one key referenced in the query and additionally includes at least one additional key that prevents traversal of the index to determine the number of rows that the query will return (Figure 3, et seq.); and

a query optimizer residing in the memory and executed by the at least one processor, wherein the query optimizer, for each additional key in the index, reads statistical information regarding the additional key (See claim 5 rejection).

Lee does not explicitly disclose,

• rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query.

• determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query.

However, Balmin and Jakobsson respectively disclose the above features.

First, Balmin discloses rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query (paragraph 17, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Balmin's method of rewriting the query would have enabled Lee's overall system to speed up the processing of potentially expensive queries by using pre-computed information (paragraph 16 lines 1 – 3, et seq.).

Second, Jakobsson discloses determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query (paragraph 10, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Jakobsson's method of determining an estimated number of rows that satisfy the query would have enabled Lee's overall system to estimate the cost of alternative execution plans (paragraph 10 line 3, et seq.) and reduce CPU usage and physical disk reads (paragraph 33 lines 1 – 2, et seq.).

Regarding claim 14, Lee discloses,

A method for optimizing a database query for a database table, the method comprising the steps of:

(1) analyzing the query (Figure 1 element 20, column 5 lines 31 – 33, et seq.);

(2) if no optimal index for the query exists, determining if a sub-optimal index exists, a sub-optimal index including at least one key referenced in the query and additionally including at least one additional key that prevents traversal of the sub-optimal index to determine the number of rows that the query will return (column 2 lines 42 – 44, column 5 lines 56 – 65, et seq.);

(3) if a sub-optimal index exists, performing the following steps for each additional key in the sub-optimal index that prevents traversal of the sub-optimal index to determine the number of rows that the query will return :

(A) reading statistical information regarding the additional key (column 6 lines 14 – 19; 42 – 47, et seq.); and

(4) probing the sub-optimal index (column 6 lines 14 – 19; 42 – 47, et seq.).

Lee does not explicitly disclose,

• rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query.

• determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query.

However, Balmin and Jakobsson respectively disclose the above features.

First, Balmin discloses rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query (paragraph 17, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Balmin's method of rewriting the query would have enabled Lee's overall system to speed up the processing of potentially expensive queries by using pre-computed information (paragraph 16 lines 1 – 3, et seq.).

Second, Jakobsson discloses determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query (paragraph 10 lines, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Jakobsson's method of determining an estimated number of rows that satisfy the query would have enabled Lee's overall system to estimate the cost of alternative execution plans (paragraph 10 line 3, et seq.) and reduce CPU usage and physical disk reads (paragraph 33 lines 1 – 2, et seq.).

Regarding claim 22, Lee discloses,

A computer-readable program product comprising:

(A) a query optimizer that analyzes a query for a database table, and if no optimal index for the query exists, the query optimizer determines if a sub-optimal index exists, a sub-optimal index including at least one key referenced in the query and additionally including at least one additional key that prevents traversal of the sub-

optimal index to determine the number of rows that the query will return (column 2 lines 42 – 44, column 6 lines 56 – 60, et seq.), wherein if a sub-optimal index exists, the query optimizer, for each additional key in the sub-optimal index, reads statistical information regarding the additional key (column 6 lines 14 – 19; 42 – 47, et seq.); and

(B) recordable media bearing the query optimizer.

Lee does not explicitly disclose,

• rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query.

• determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query.

However, Balmin and Jakobsson respectively disclose the above features.

First, Balmin discloses rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query (paragraph 17, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Balmin's method of rewriting the query would have enabled Lee's overall system to speed up the processing of potentially expensive queries by using pre-computed information (paragraph 16 lines 1 – 3, et seq.).

Second, Jakobsson discloses determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the

query (paragraph 10 lines 10 – 16, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Jakobsson's method of determining an estimated number of rows that satisfy the query would have enabled Lee's overall system to estimate the cost of alternative execution plans (paragraph 10 line 3, et seq.) and reduce CPU usage and physical disk reads (paragraph 33 lines 1 – 2, et seq.).

Regarding claim 26, Lee discloses,

A computer-readable program product comprising:

(A) a query optimizer that processes a query for a database table using a sub-optimal index that includes at least one key referenced in the query and additionally includes at least one additional key that prevents traversal of the sub-optimal index to determine the number of rows that the query will return (column 2 lines 42 – 44, column 6 lines 56 – 60, et seq.), wherein the query optimizer, for each additional key in the index, reads statistical information regarding the additional key (column 6 lines 14 – 19; 42 – 47, et seq.); and

(B) computer-readable signal bearing media bearing the query optimizer.

Lee does not explicitly disclose,

• rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query.

• determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query.

However, Balmin and Jakobsson respectively disclose the above features.

First, Balmin discloses rewriting the query using the statistical information in a manner that allows probing the sub-optimal index according to the rewritten query (paragraph 17, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Balmin's method of rewriting the query would have enabled Lee's overall system to speed up the processing of potentially expensive queries by using pre-computed information (paragraph 16 lines 1 – 3, et seq.).

Second, Jakobsson discloses determining from the sub-optimal index an estimated number of rows in the database table that satisfy the query and optimizing the query based on the estimated number of rows in the database table that satisfy the query (paragraph 10 lines 10 – 16, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Jakobsson's method of determining an estimated number of rows that satisfy the query would have enabled Lee's overall system to estimate the cost of alternative execution plans (paragraph 10 line 3, et seq.) and reduce CPU usage and physical disk reads (paragraph 33 lines 1 – 2, et seq.).

Claims 6, 8, 15, 25 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, Balmin and Jakobsson, further in view of Lohman.

Regarding claim 6, Lee, Balmin and Jakobsson disclose the apparatus of claim 5.

Lee, Balmin and Jakobsson do not explicitly disclose the statistical information comprises a frequent value list.

However, Lohman discloses the statistical information comprises a frequent value list (paragraph 35 lines 10 – 15, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Lohman's use of frequent value list would have enabled Lee, Balmin and Jakobsson's overall system to estimate query cost, and also automate the process of candidate selection.

Regarding claim 8, Lee, Balmin and Jakobsson disclose the apparatus of claim 7.

Lee, Balmin and Jakobsson do not explicitly disclose the statistical information comprises a frequent value list.

However, Lohman discloses the statistical information comprises a frequent value list (paragraph 35 lines 10 – 15, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Lohman's use of frequent value list would have enabled Lee, Balmin and Jakobsson's overall system to estimate query cost, and also automate the process of candidate selection.

Regarding claim 15, Lee, Balmin and Jakobsson disclose the method of claim 14.

Lee, Balmin and Jakobsson do not explicitly disclose the statistical information comprises a frequent value list.

However, Lohman discloses the statistical information comprises a frequent value list (paragraph 35 lines 10 – 15, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Lohman's use of frequent value list would have enabled Lee, Balmin and Jakobsson's overall system to estimate query cost, and also automate the process of candidate selection.

Regarding claim 25, Lee, Balmin and Jakobsson disclose the program product of claim 22.

Lee, Balmin and Jakobsson do not explicitly disclose the statistical information comprises a frequent value list.

However, Lohman discloses the statistical information comprises a frequent value list (paragraph 35 lines 10 – 15, et seq.). At the time of the present invention, it would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Lohman's use of frequent value list would have enabled Lee, Balmin and Jakobsson's overall system to estimate query cost, and also automate the process of candidate selection.

Regarding claim 29, Lee, Balmin and Jakobsson disclose the program product of claim 26.

Lee, Balmin and Jakobsson do not explicitly disclose the statistical information comprises a frequent value list.

However, Lohman discloses the statistical information comprises a frequent value list (paragraph 35 lines 10 – 15, et seq.). At the time of the present invention, it

would have been obvious to a person of ordinary skill in the data processing art to combine the two references because Lohman's use of frequent value list would have enabled Lee, Balmin and Jakobsson's overall system to estimate query cost, and also automate the process of candidate selection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sangwoo Ahn whose telephone number is (571) 272-5626. The examiner can normally be reached on M-F 10-6.

Patent Examiner Sangwoo Ahn
AU 2166

3/27/2007 SW

HOSAIN ALAM
SUPERVISORY PATENT EXAMINER